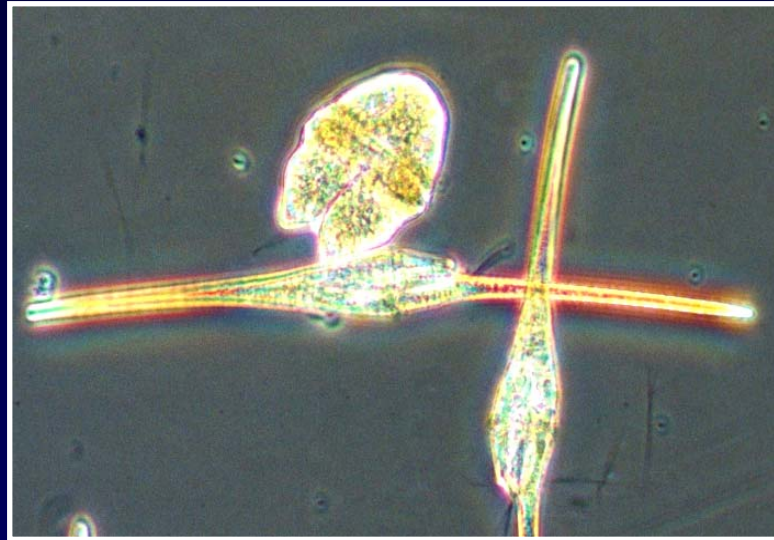


# Phytoplankton in South Puget Sound – Findings, Trends and Ongoing Research

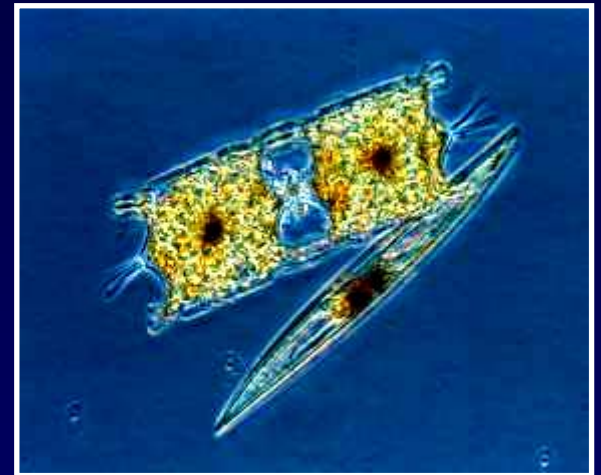


Aimee Christy  
Pacific Shellfish Institute  
Olympia, WA

# Why Study Phytoplankton?

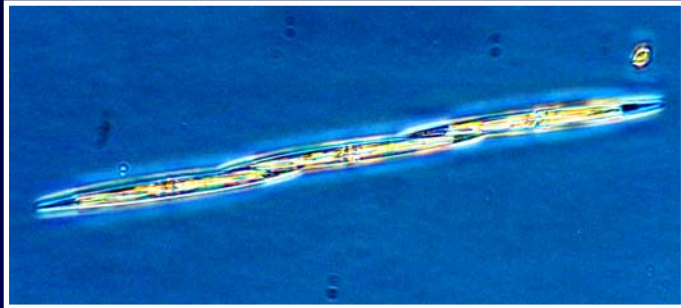
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- Basis of marine food web
- Eutrophication
- Species of Concern
  - Human Health
  - Fisheries Concerns

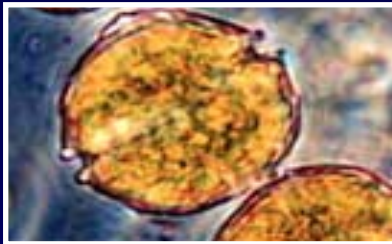


# Species of Concern – Human Health

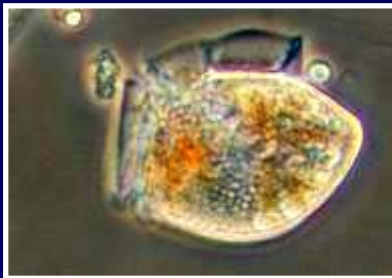
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*Pseudo-nitzschia spp.*



*Alexandrium catenella*

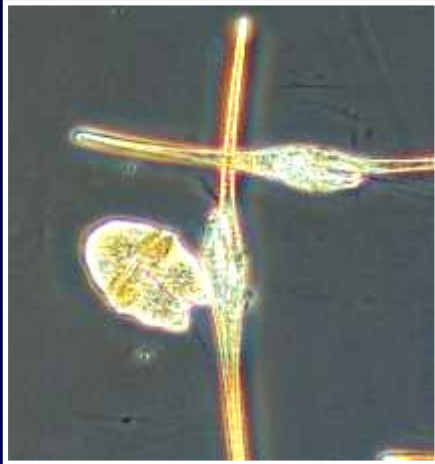


*Dinophysis spp.*

Photo credit: D. Cheney, J. Rines, A. Christy

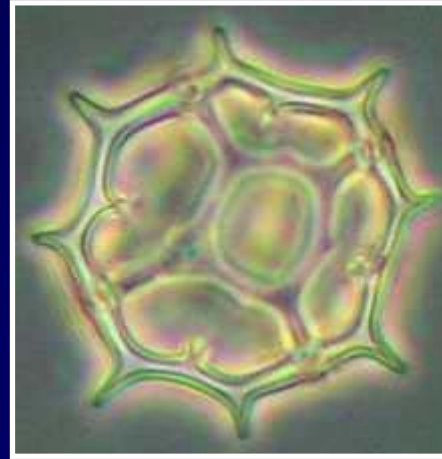
# Species of Concern - Fisheries

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*Ceratium fusus* &  
*Akashiwo sanguinea*

*Heterosigma akashiwo*



*Chaetoceros* spp.

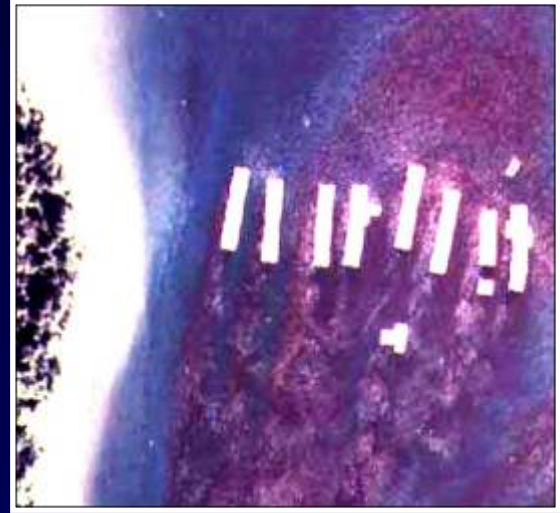
*Dictyocha* spp.

Photos credit: A. Christy, M. Middleton, J. Rines , A. Sarich

# PSI Research

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- SeaGrant's NMAI Program
  - Totten Inlet (2002 – 2003)



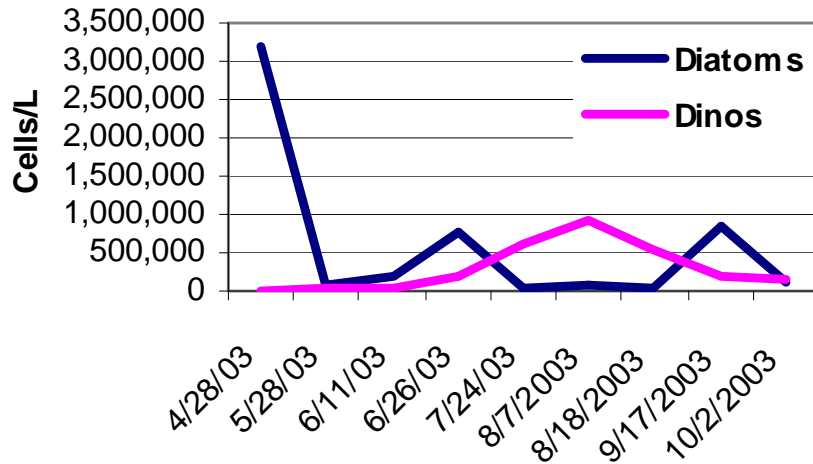
- SeaGrant's Oyster Disease Program
  - Eld Inlet (2002 – 2004)
  - Totten Inlet (2005 – 2007)



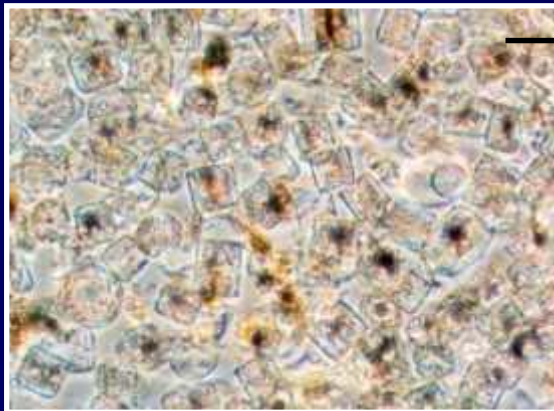
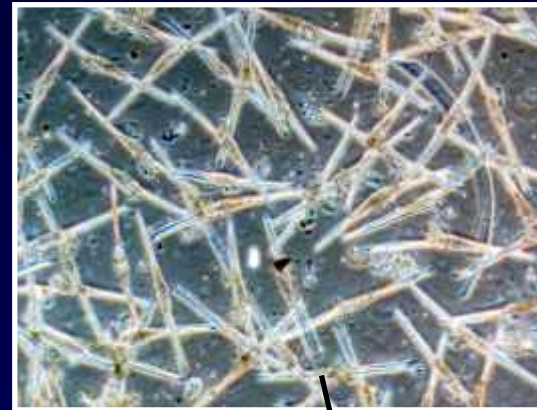


# Seasonal Trends

2003 Totten Phytoplankton  
Reference Station

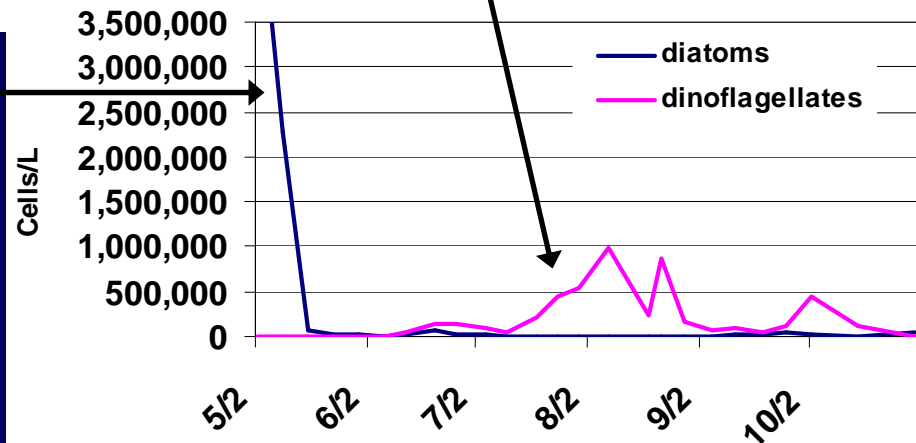


*Ceratium fusus*

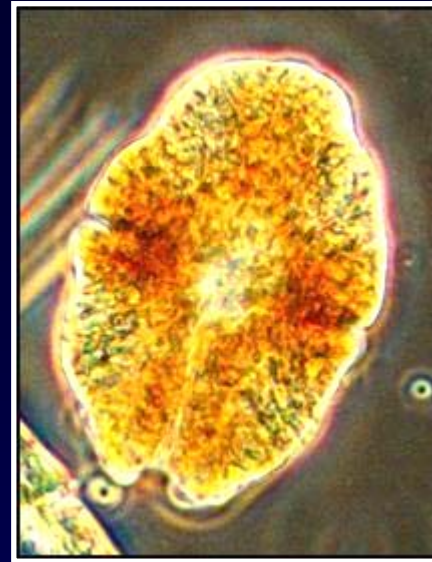


*Cerataulina pelagica*

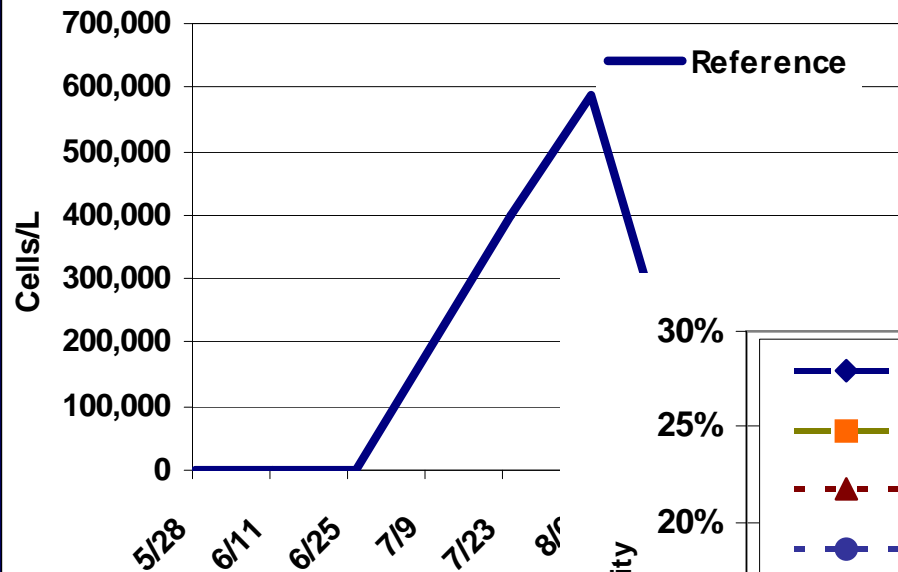
2003 Eld Phytoplankton



# Akashiwo sanguinea

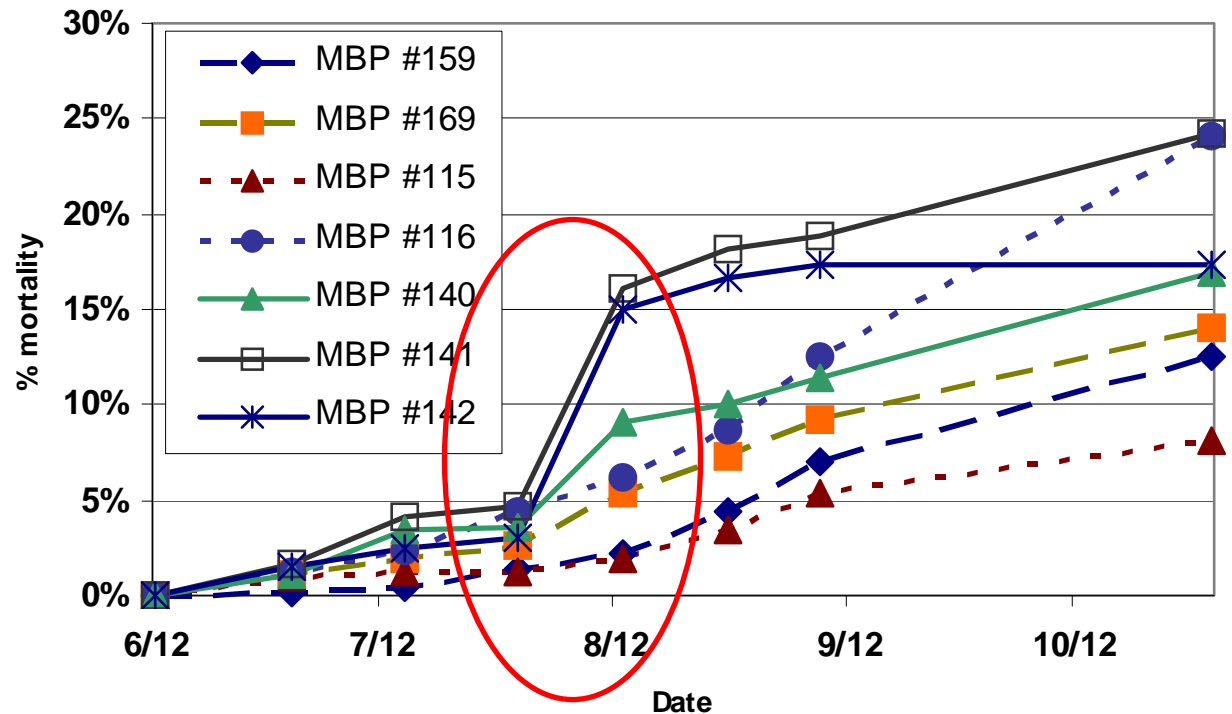


2003 Totten A. sanguinea



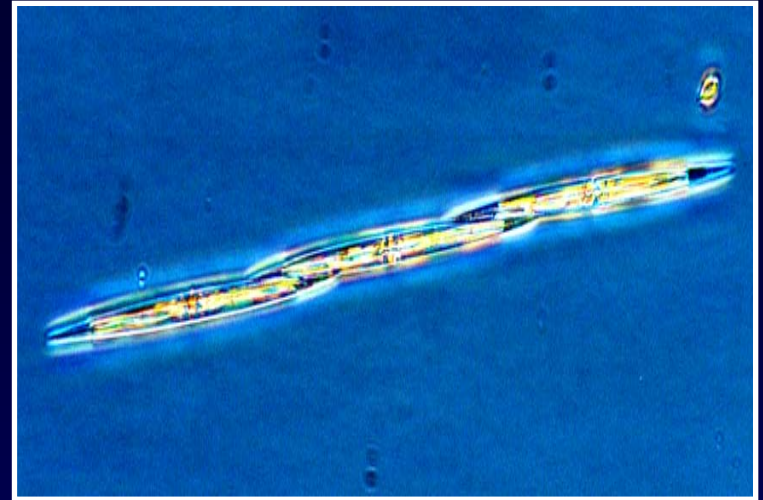
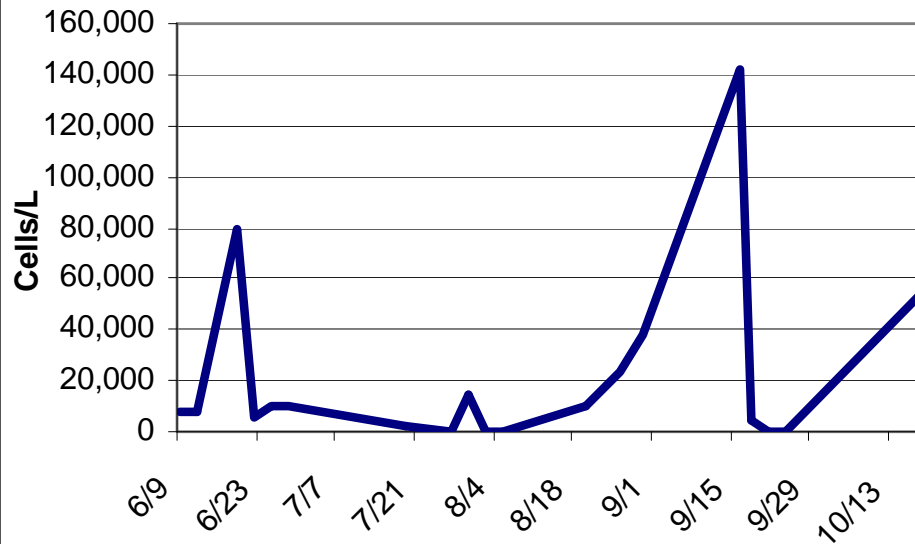
Bricelj et al. 1992

“Blooms of *G. sanguinea* at peak densities of 500,000 cells/L at time of initial oyst

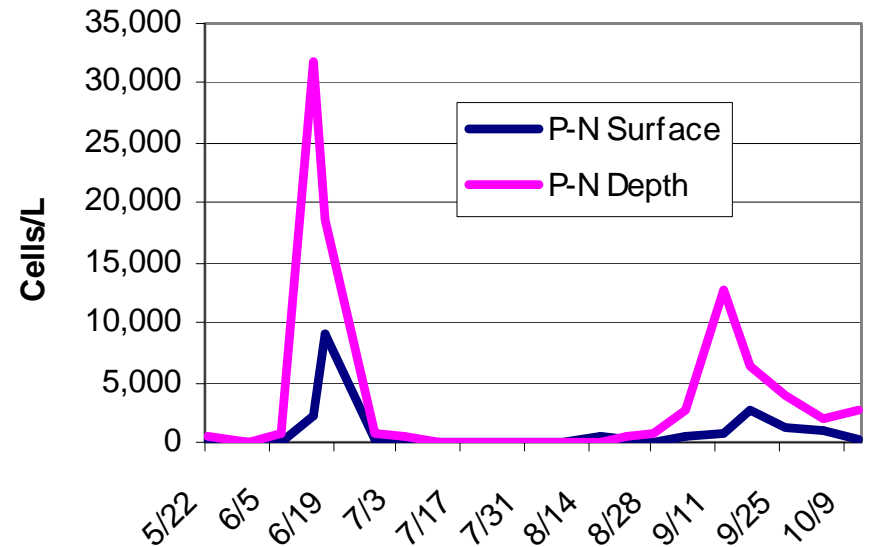


# *Pseudo-nitzschia*

2002 Totten Pseudo-nitzschia



2002 Eld Pseudo-nitzschia



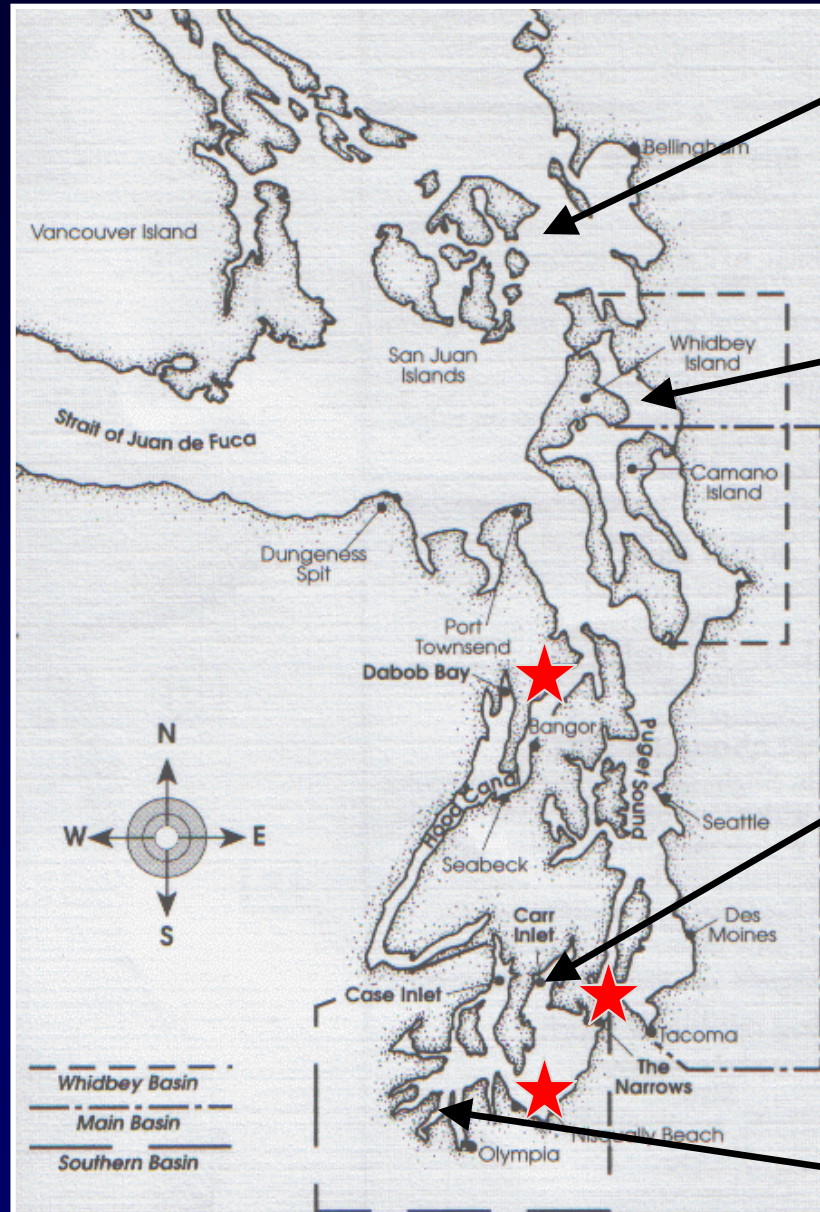
2006 - Domoic acid detected in mussels at 1-ppm in Case Inlet



# Migration of PSP Closures

Rensel, J. 1993

“Increased nitrogen discharge from rapid urbanization & non-pt sources could lead to PSP problems in areas presently unaffected by PSP.”



1958

1978

1988

1997

# PST Trends (Trainer et al. 2003)

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- Frequency of PST detection has increased in SPS
- Increased magnitude of PSTs possibly explained by PDO and increased eutrophication

“Because the depth of SPS inlets is much shallower and flushing time is slower, nutrient inputs to surface waters provide ideal growth conditions for *A. catenella*”

# Alexandrium

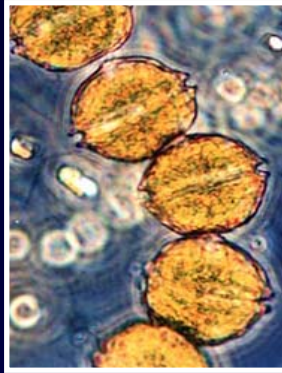


Photo credit: Jan Rines

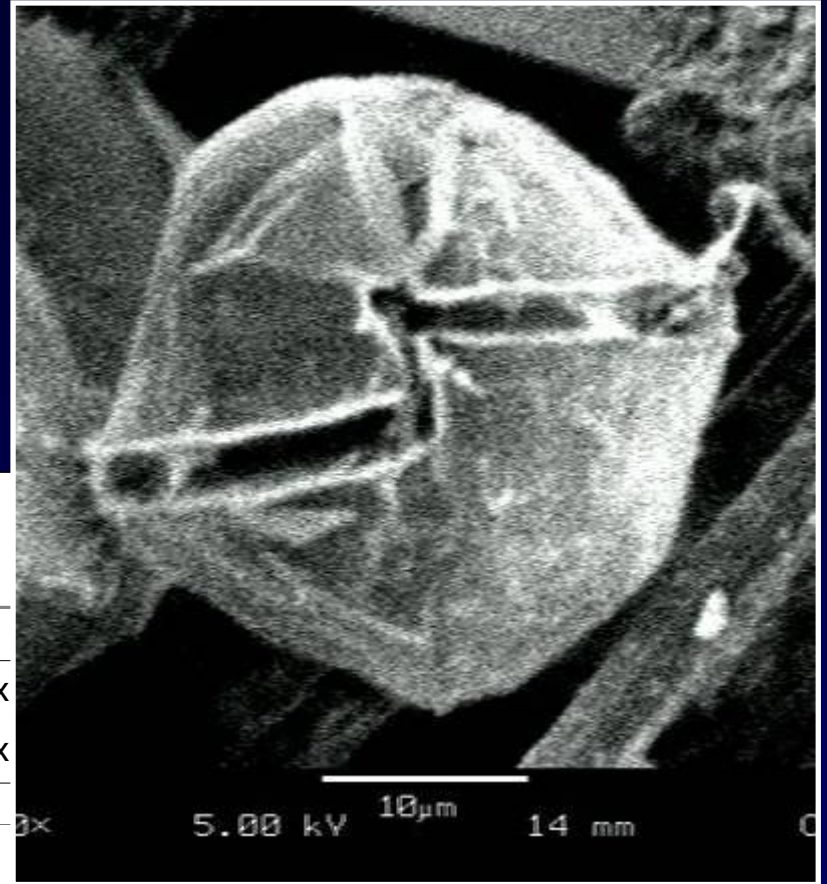
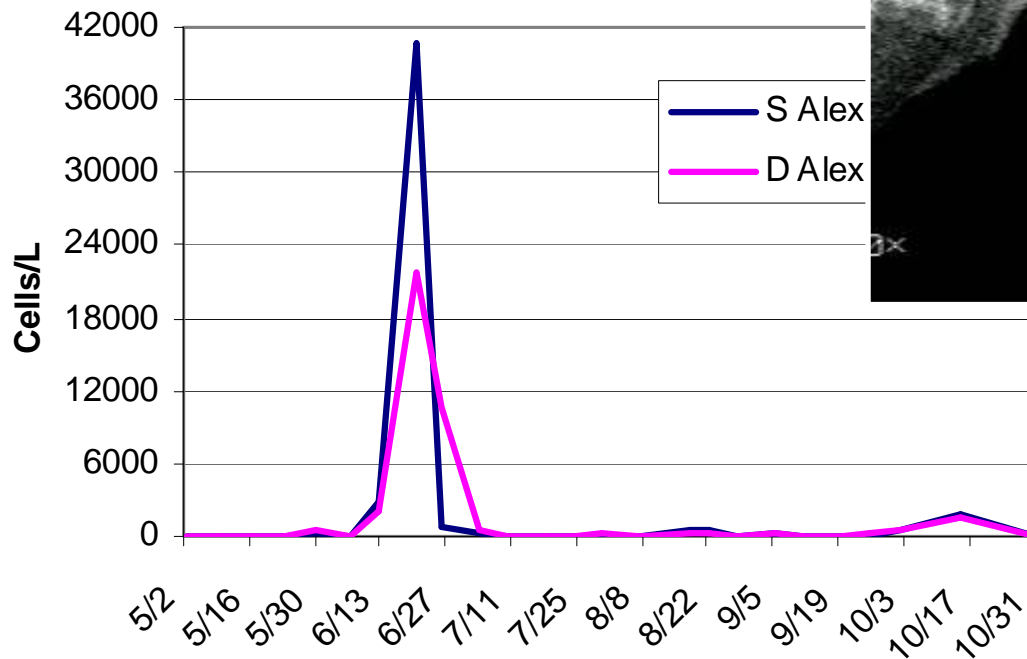


Photo credit: A. Christy & G. Chin-Leo

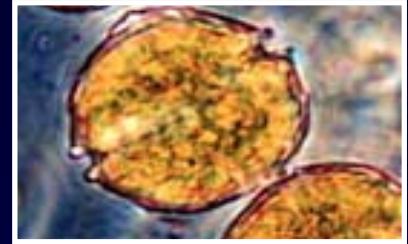
2003 Eld Inlet Alexandrium



# NOAA's ECOHAB Program

## – UW Tacoma and UW School of Oceanography

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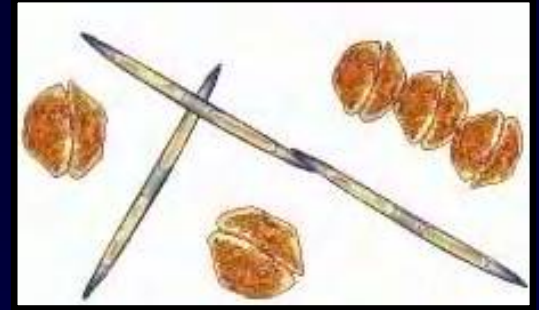


- Distribution & viability of *Alexandrium* cysts
- Connection between cysts and PSP outbreaks
- Impact of sills and bay mouths on resuspension of cysts
- 32 PS stations, 6 in SPS (Budd, Totten, Eld, Carr, Case, Quartermaster Harbor)

Contacts: Cheryl Greengrove and Rita Horner, UW

# NWFSC's SoundToxins Monitoring Program

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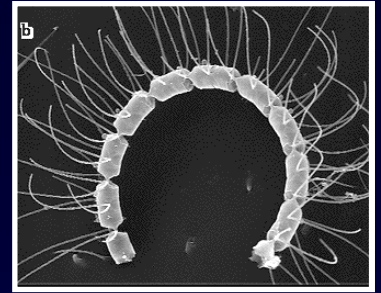
- Partnership for enhanced monitoring & emergency response
- Determine environmental conditions that promote HABs
- Determine initiation point for PS HABs
- 8 Puget Sound locations (Quartermaster Harbor)
- Monitor HAB sp (4), toxins, chl, nut, temp, salin

Contacts: Vera Trainer or Keri Baugh



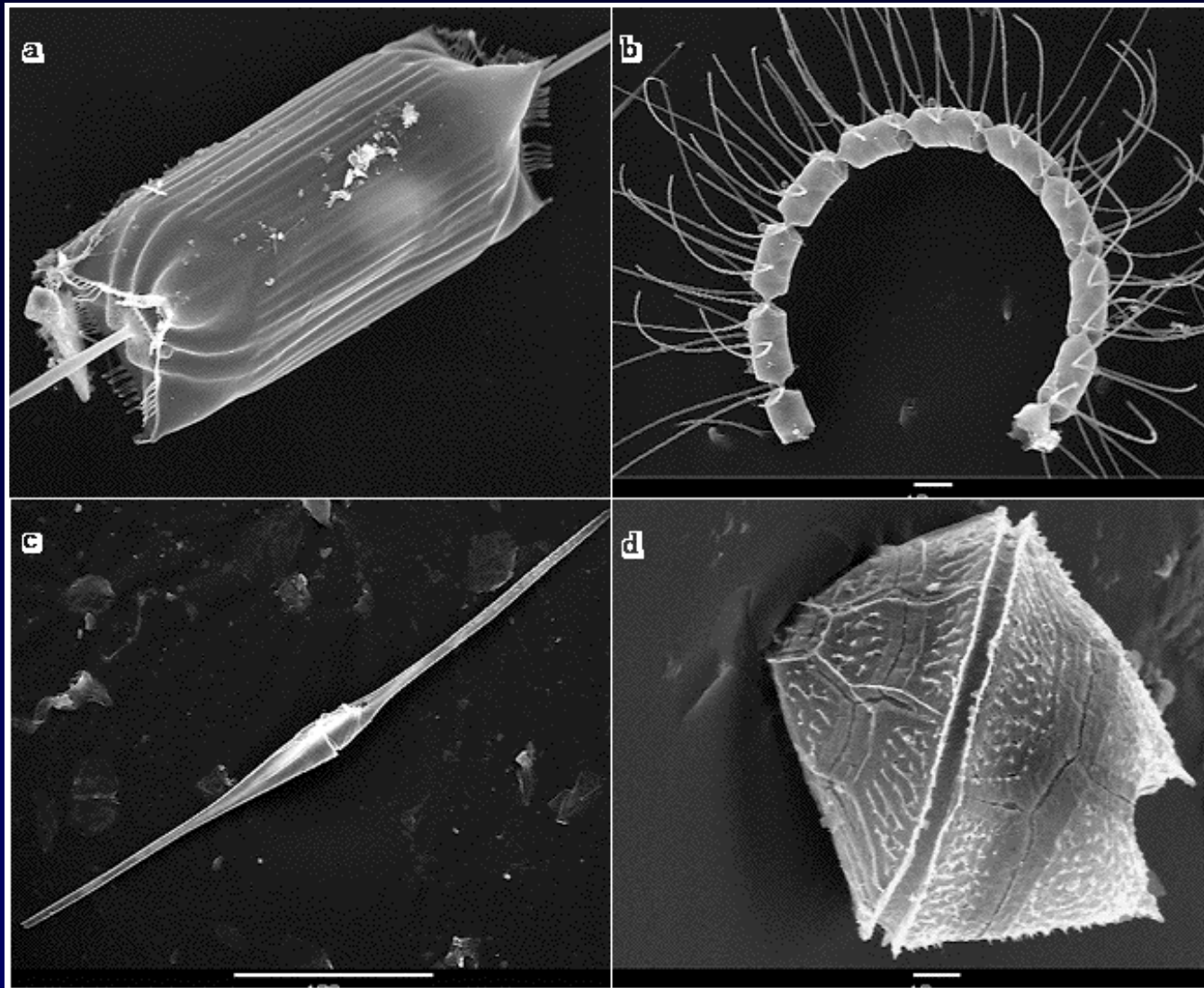
# The Evergreen State College

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- Undergraduate and graduate courses that include field and lab studies, independent research projects
  - Species composition & biomass
  - Nutrient & plankton interactions
  - Dinoflagellate cyst distribution
- Goal is to establish long-term monitoring
- Special projects
  - SEM documentation of dominant summer species

Contact: Gerardo Chin-Leo



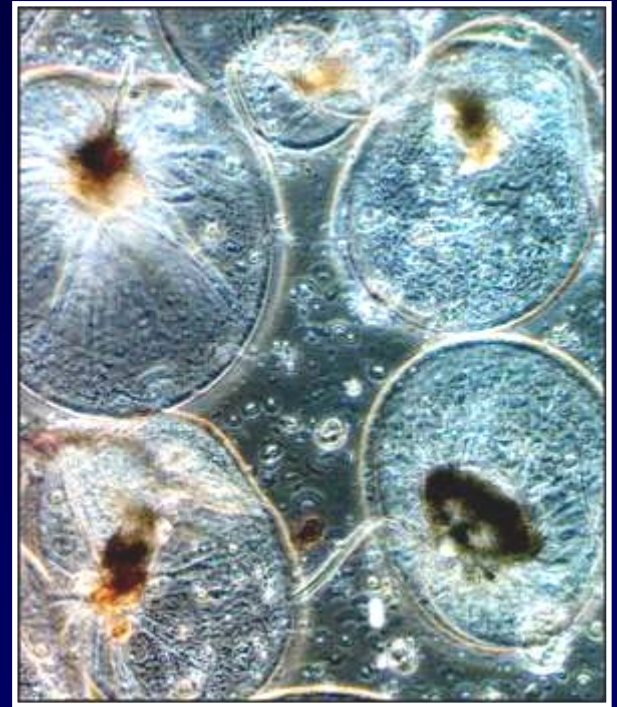
Some phytoplankton species from Budd Inlet, a, *Ditylum brightwellii* (length=100  $\mu\text{m}$ ), b, *Chaetocerus curvisetus* (bar=10  $\mu\text{m}$ ), c, *Ceratium fusus* (bar=10  $\mu\text{m}$ ), d, *Protoperidinium* spp (bar=10  $\mu\text{m}$ )

Photo credit: Gerardo Chin-Leo

# Conclusions

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- On-going monitoring of plankton species composition & biomass are needed
- Nutrient inputs may have a profound impact on the presence & proliferation of certain HAB species



*Noctiluca scintillans*

# Contact Information

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Pacific Shellfish Institute

[www.pacshell.org](http://www.pacshell.org)

Aimee Christy

Mary Middleton

